@ High Luminosity Preliminary results

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Goals

- To try some shape variables to suppress fake jets @ high luminosity.

- Find a variable to differ the real jets from fake jets.

- Check whether these variables works both for generated and reconstructed jets.

Difficulties

- There are many fake jets at high luminosity especially at low energies, below 50 GeV.

- There are particle sharing between jets.

- Everywhere full of jets with low jet Et (below 20 GeV) and low seed Et cut (below 2 GeV).

Cuts and Selection variables

- Max Et fraction from single vertex(Et^{mx}_{svx}) is used to differ real jets and from fake jets :

    If (Et^{mx}_{svx}) ≥ 0.5, jet is considered as a real jet and

    if (Et^{mx}_{svx}) < 0.5 jet is considered as a fake jet.

    Since this variable are not available in the real life (but some tracker information might be useful) two other variables used as a cut :

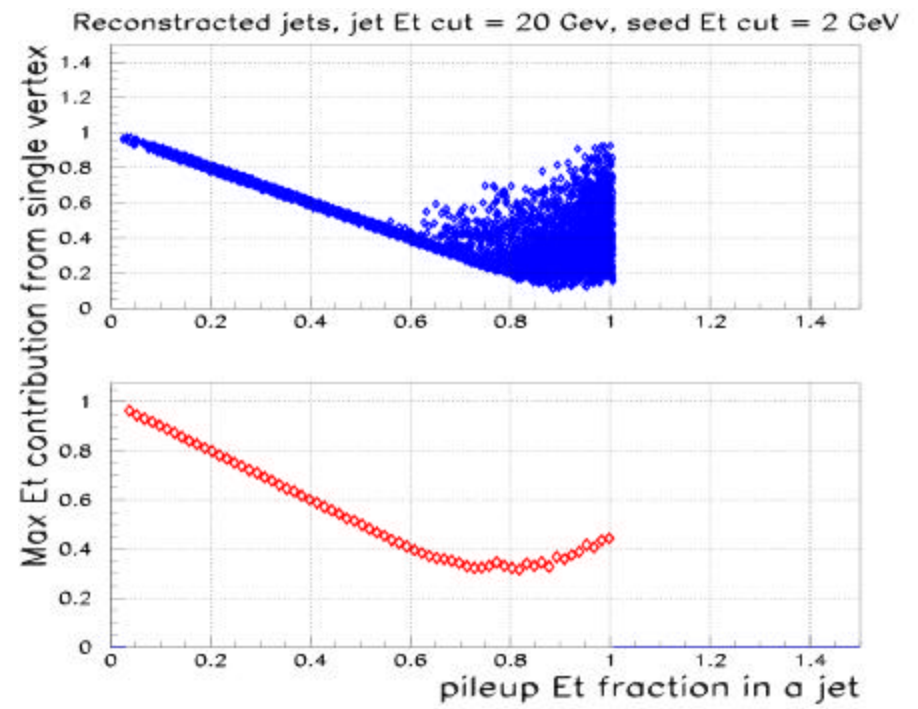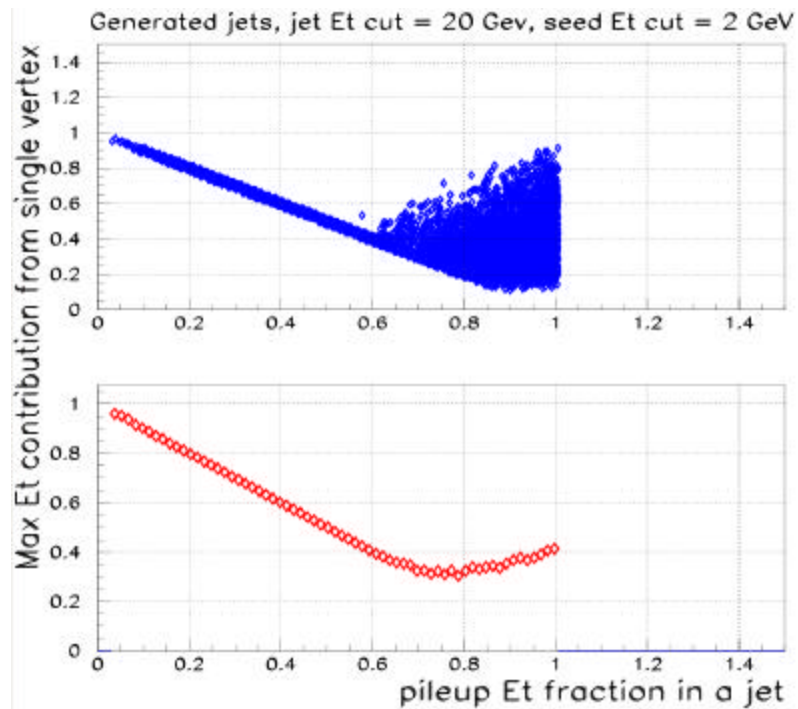1-) Et weighted r, $\quad r = \Sigma Et^{part} \cdot r^{part}/Et^{jet}$.

2-) Et fraction in cone r $= 0.25$,

    $Et^{r \leq 0.25}/Et^{jet} = \Sigma Et^{\ r \leq 0.25}_{\ part}/Et^{jet}$.

Studied Sample

- The sample Jm_hlt3050 with pileup is used.

- 20 GeV jet and 2 GeV seed Et cut applied for both generated and reconstructed jets.

- Jets cone was set to 0.5.

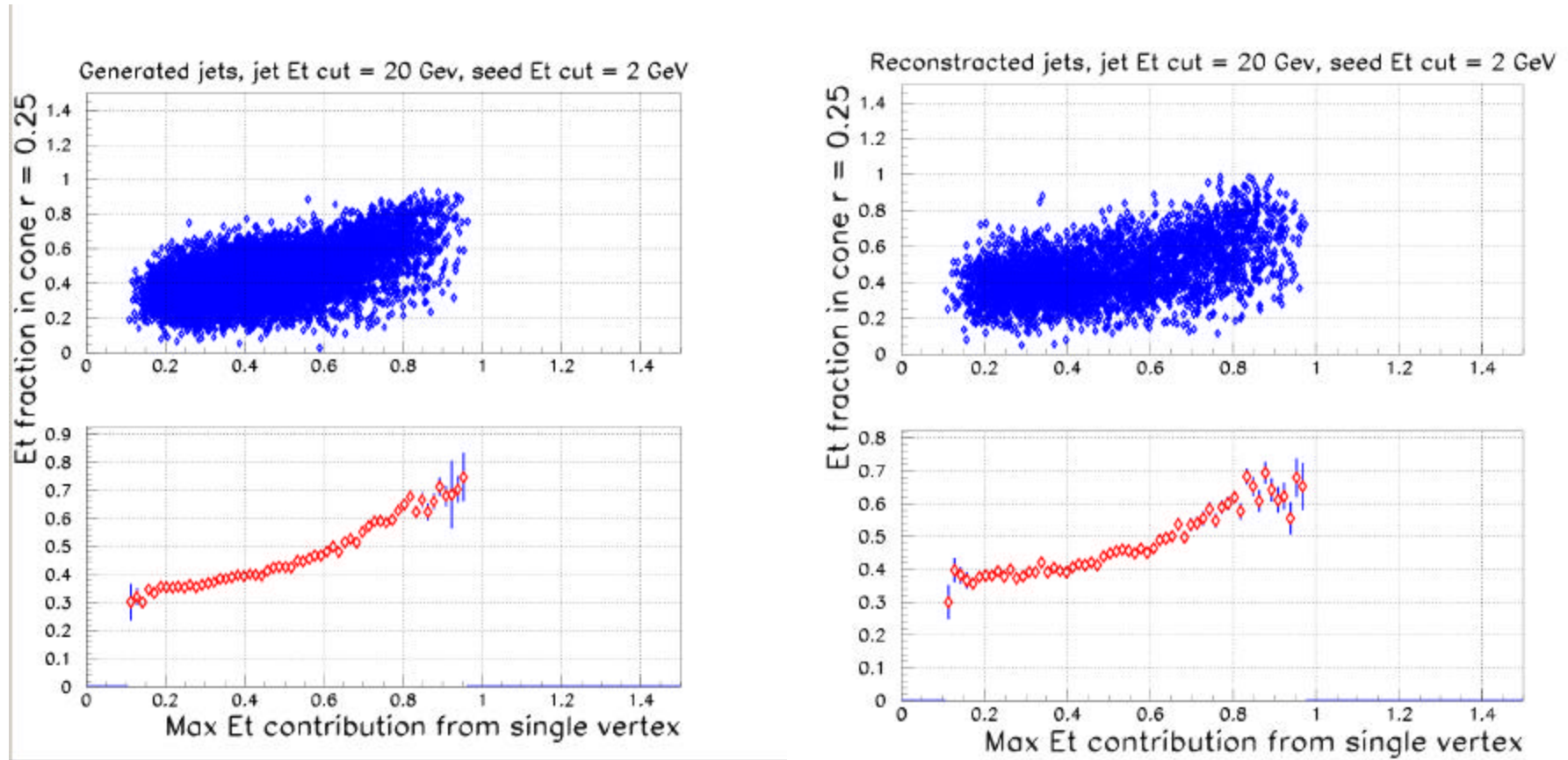- 500 events were analyzed.

Correlation between variables

Particles were tagged as a signal or pileup particle according the event which they were coming. Their Et contribution to a jet Et was calculated.

In case of reconstructed jets, for calculation of these variables, particles were extrapolated due to 4T magnetic field and were matched with corresponding reconstructed jet.
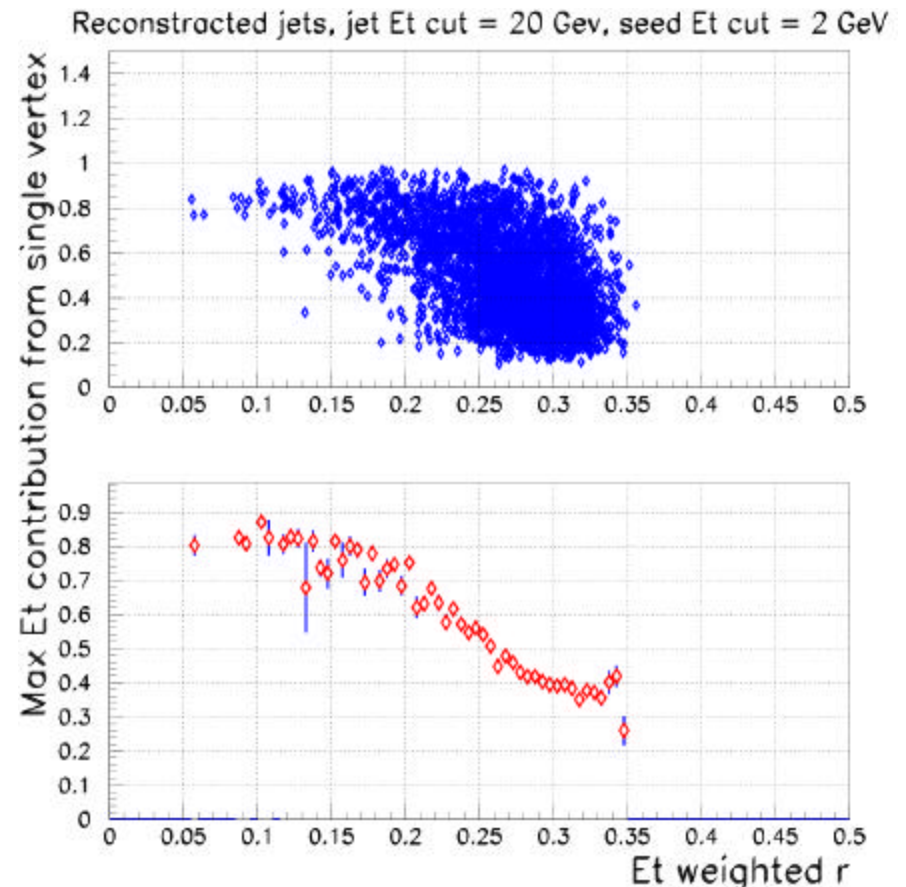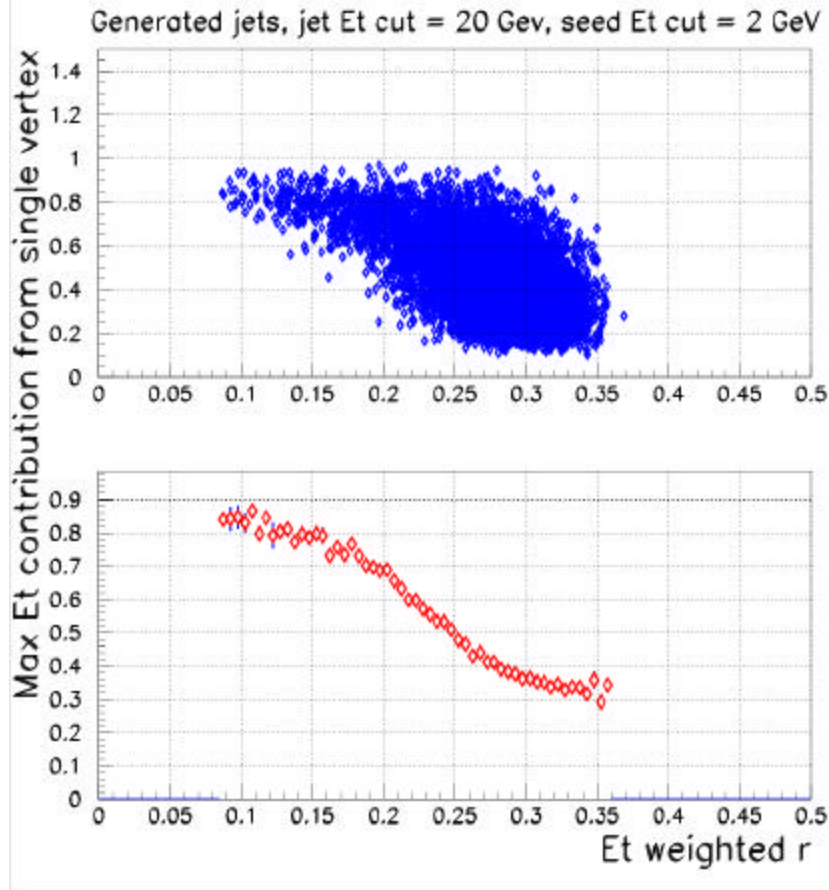
There are good correlation between Et fraction from pileup event and Max Et contribution from single vertex.

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Correlation between variables

Generated jets, jet Et cut = 20 Gev, seed Et cut = 2 GeV

Reconstructed jets, jet Et cut = 20 Gev, seed Et cut = 2 GeV

Et fraction in cone r = 0.25

Max Et contribution from single vertex

Max Et fraction from single vertex increases with increasing Et fraction in cone r = 0.25 for both Generated and reconstructed jets.
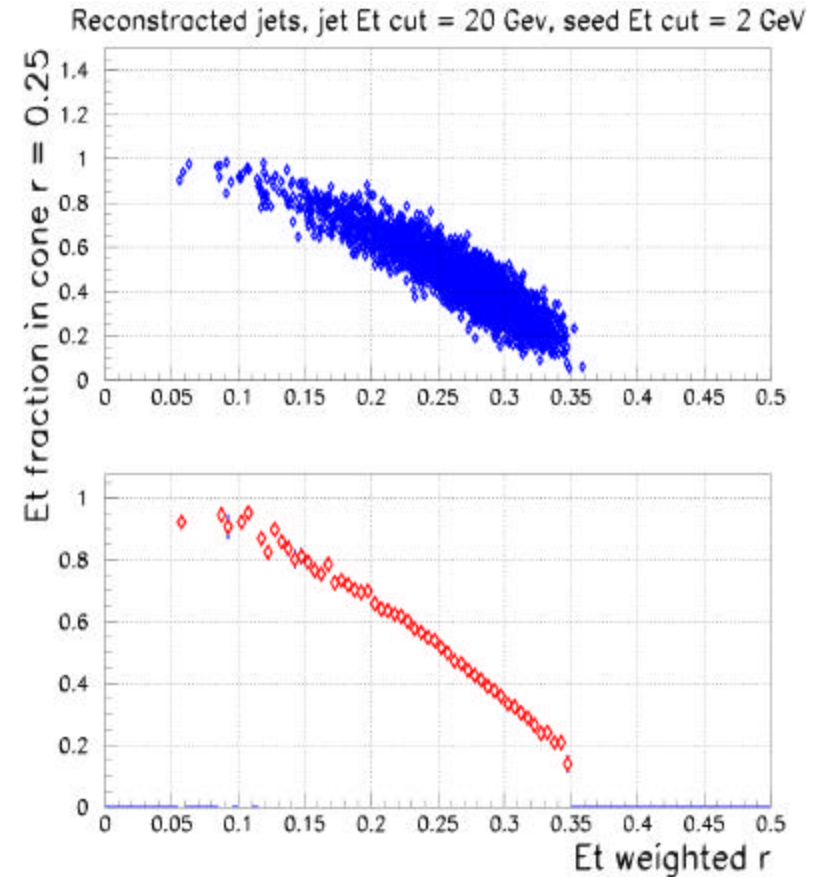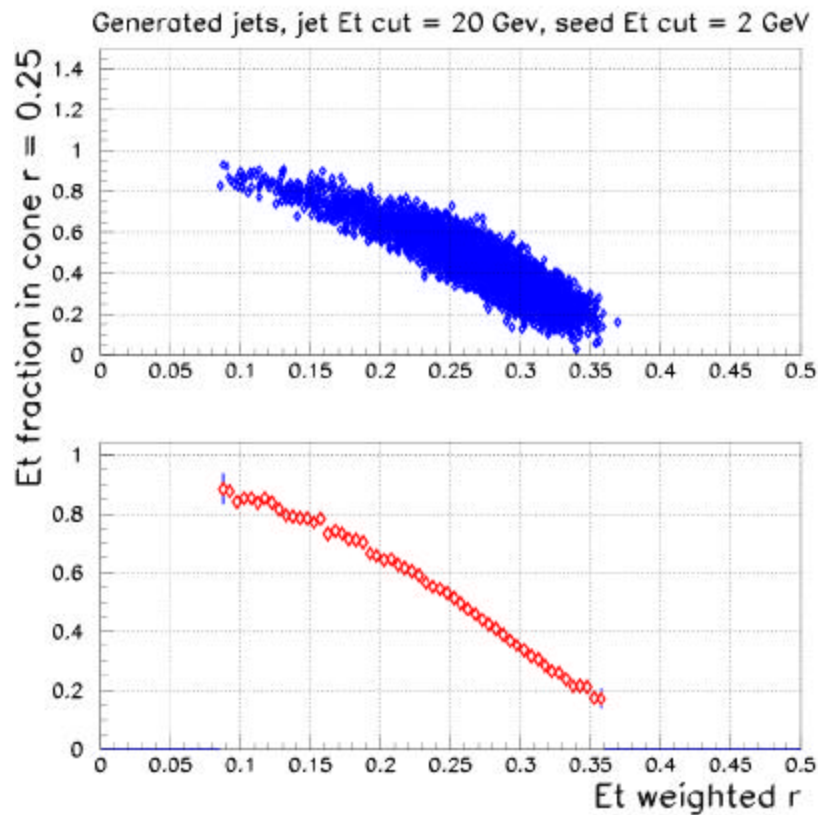Et fraction in cone r = 0.25 could be used as a cut to the some level.

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Correlation between variables

Max Et fraction degreases with increasing Et Weighted r for both Generated and reconstructed jets.
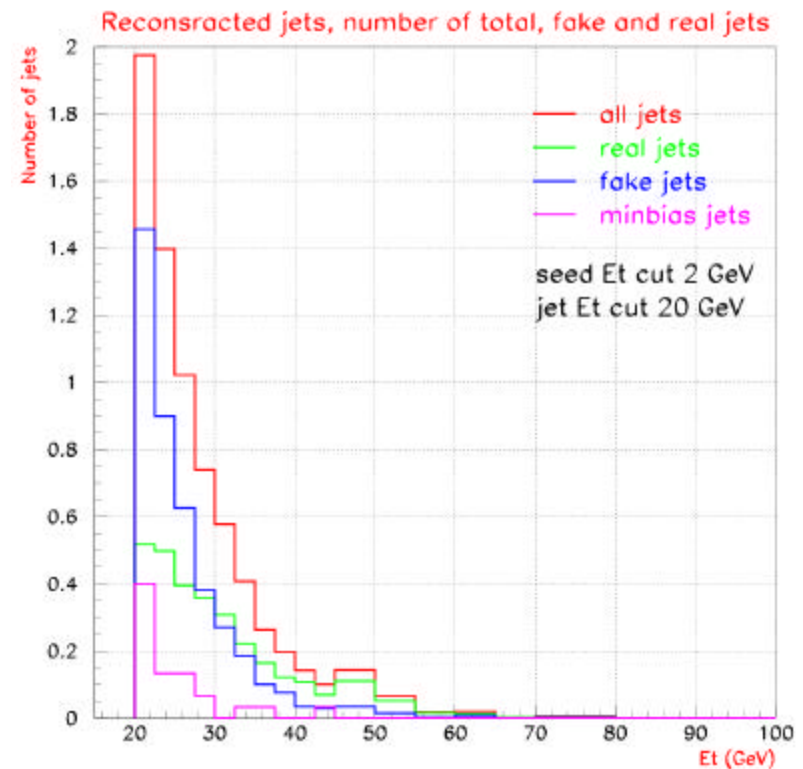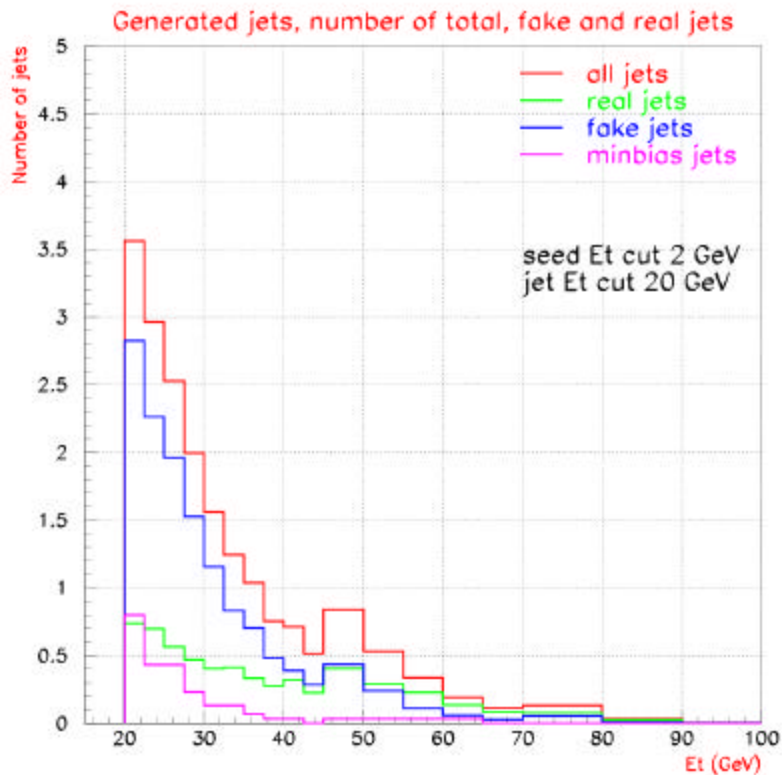
Et weighted r could be used as a cut to some level.
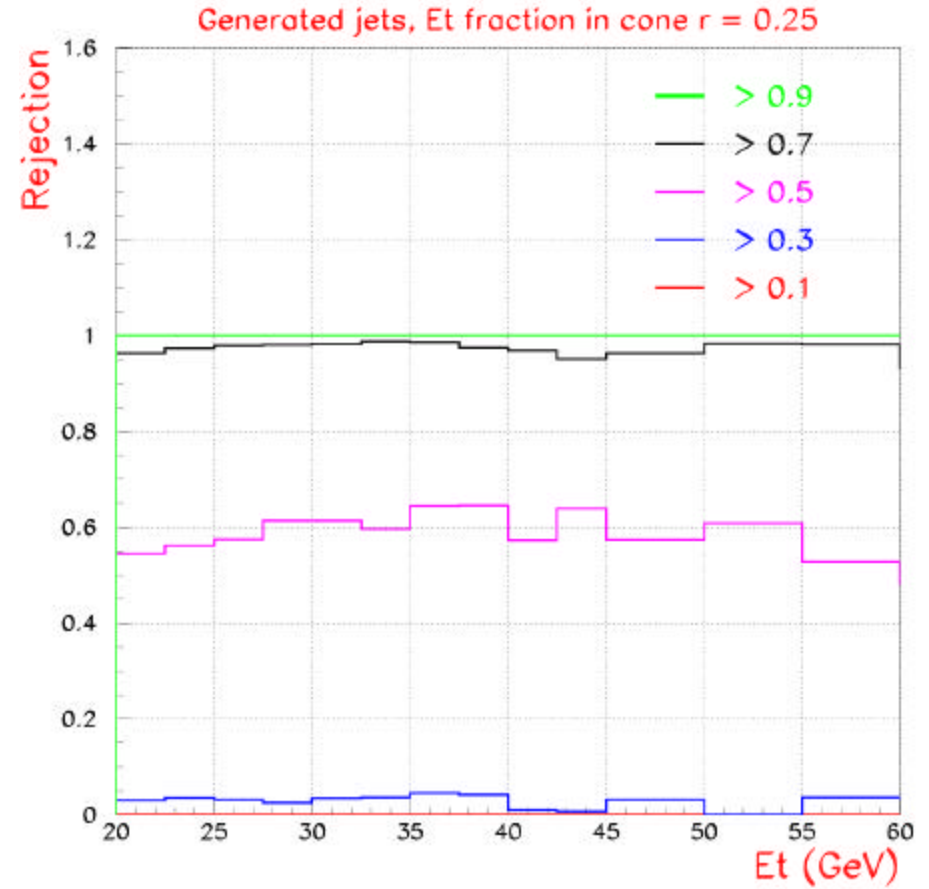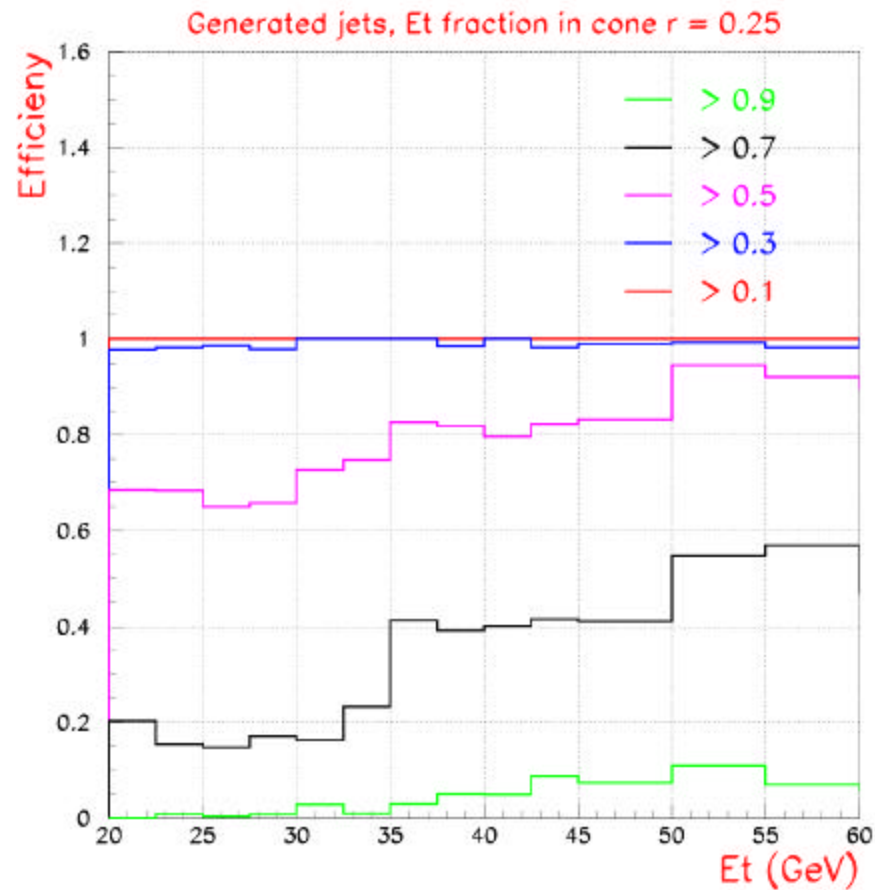
Correlation between variables

Generated jets, jet Et cut = 20 Gev, seed Et cut = 2 GeV

Reconstructed jets, jet Et cut = 20 Gev, seed Et cut = 2 GeV

There are strong correlation between these two variables

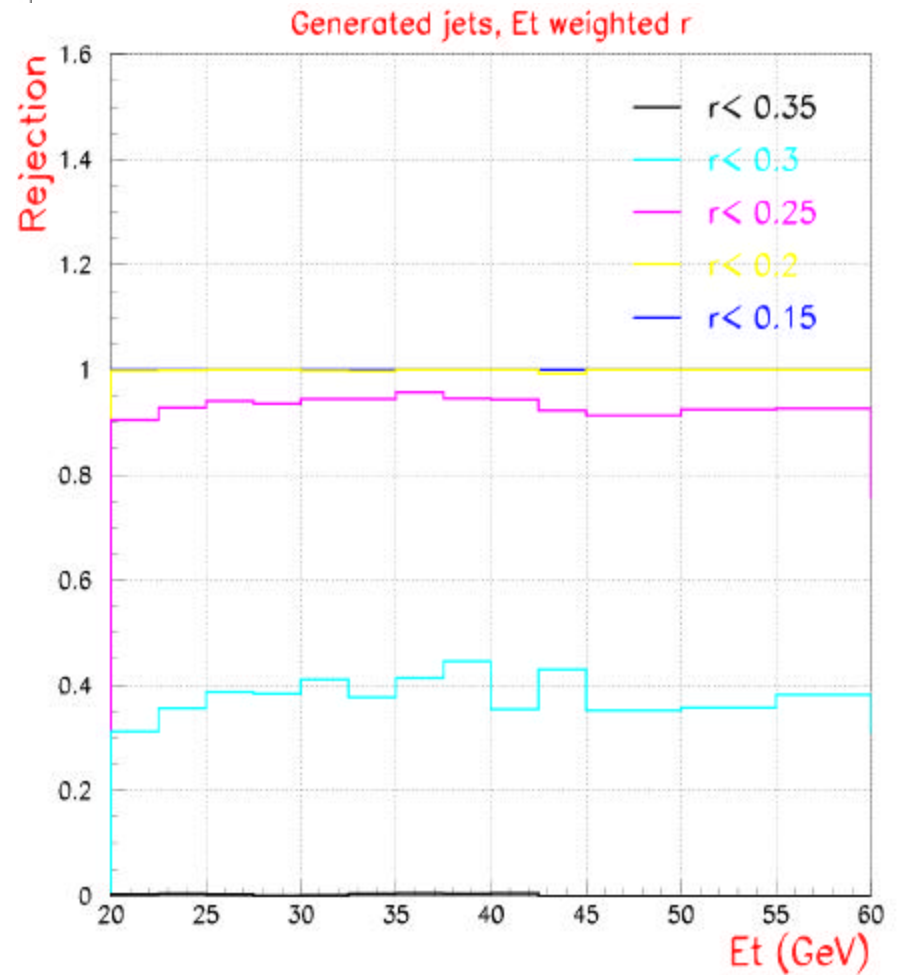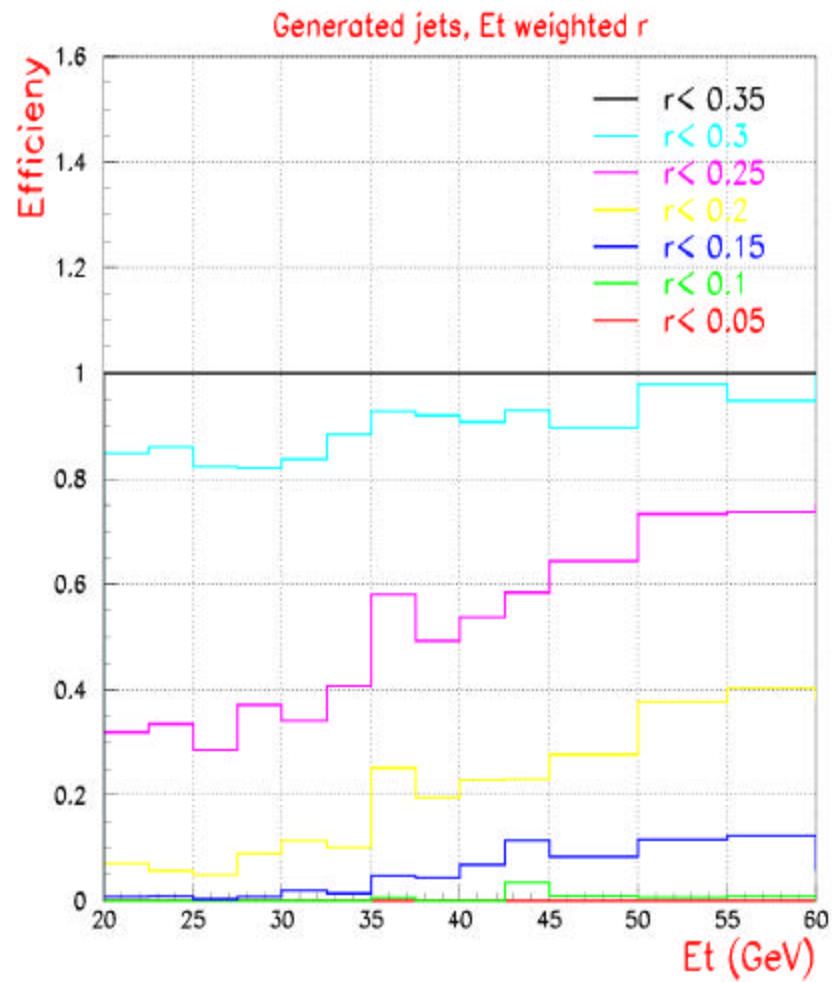# Total number of jets and number of real, fake and minbias jets
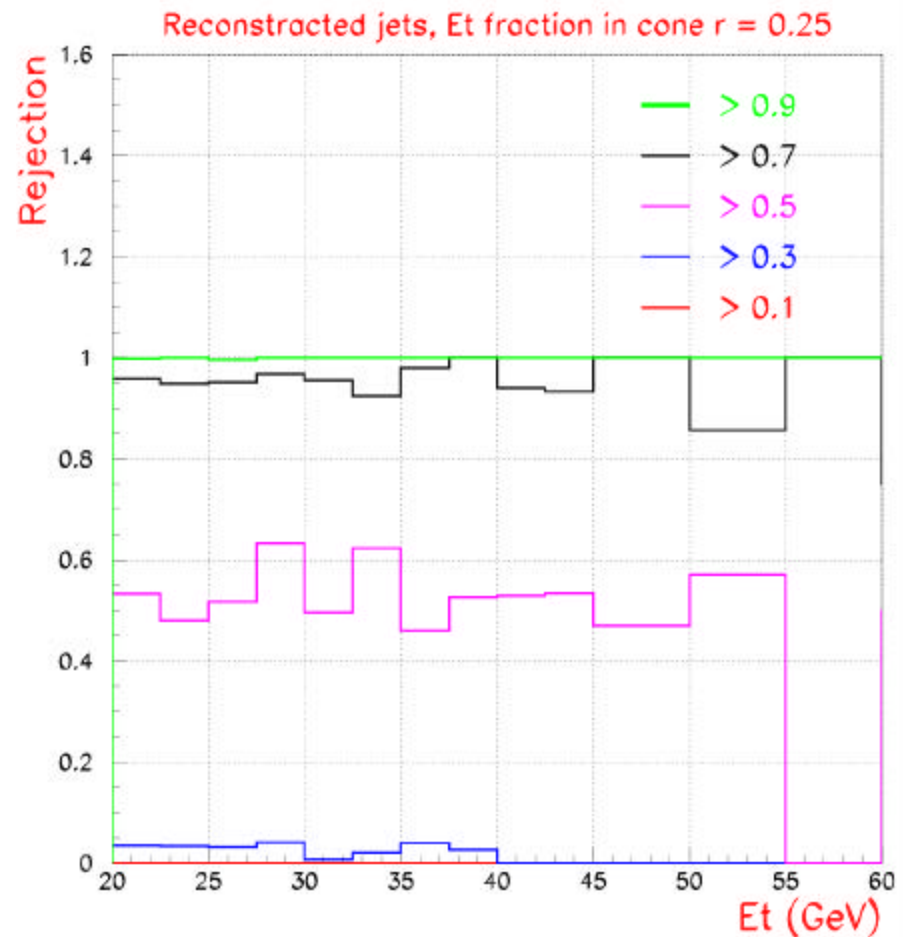
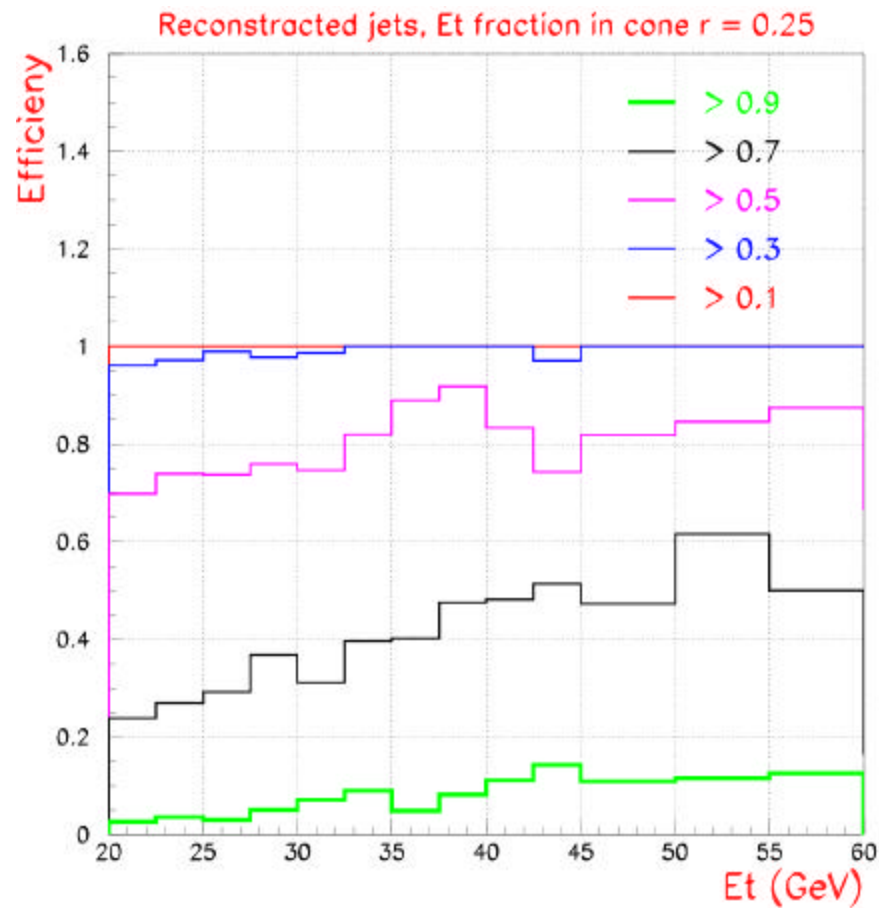# Efficiency and Rejection Results

Generated Jets

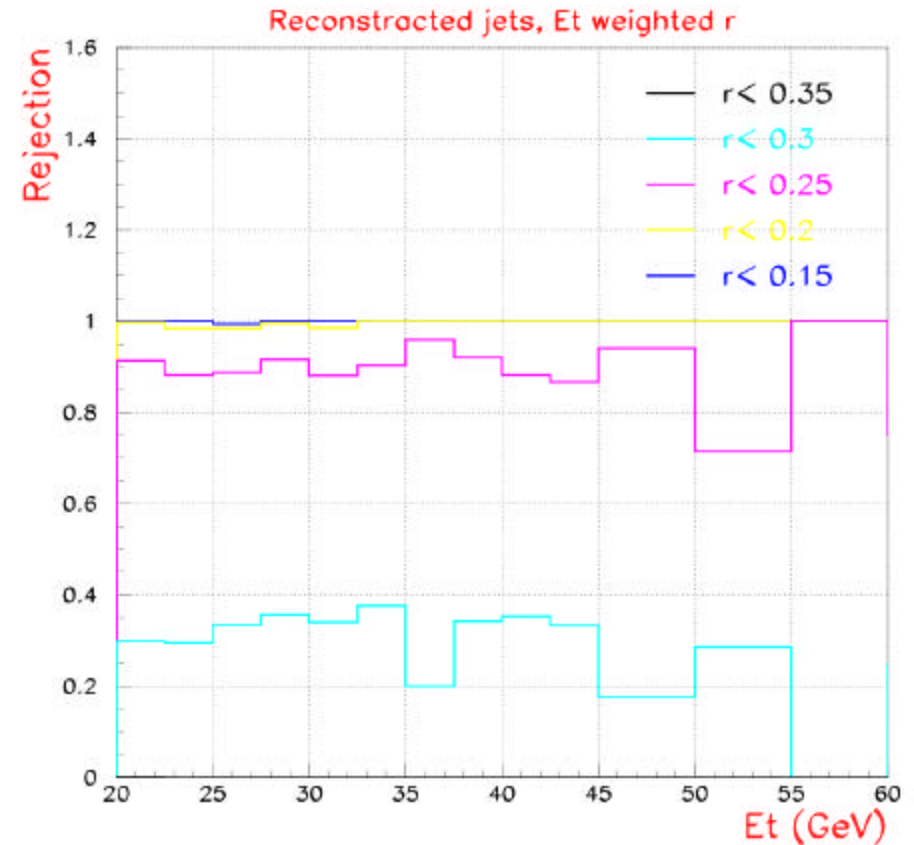# Efficiency and Rejection Results

Efficiency and Rejection Results

Reconstructed Jets

Efficiency and Rejection Results

Conclusions

- Everywhere full of Jets @ High Luminosity. However 20 GeV jet and 2 GeV seed Et cuts makes environment more cleaner.

- Both variables (Et fraction in core r=0.25 and Et weighted r) seem to be working at least to some level for generated and reconstructed jets. But they are not perfect. Also they are well correlated each other.

- Analysis need to repeated for higher statistic when ORCA6 data become available.

Future Plans

- To check whether signal efficiency and background rejection depends on eta. To use three eta ranges ($0 \leq$ eta≤ 1.5, $1.5 \leq$ eta ≤ 3 and $3 \leq$ eta ≤ 5).

- Redo same analysis when new data (ORCA6) and more statistics become available.

- To attempt to use tracker information. If tracks are traced till the calorimeter surface and could be tagged as pile up or signal particle in orca then this could be much more realistic than particle extrapolation in the presence of magnetic field. Since in the latter case multiple scattering wasn't taken in to account.